

REMARKS

The courtesies extended by Examiners Lee and Tran to the undersigned attorney for Applicants during an interview on May 2, 2007, are noted.

During the interview, Attorney for Applicants indicated that at the time the invention of the present application was made, the invention was owned by Lam Research Corporation, the owner of the Vahedi et al., U.S. Patent Publication No. 2004/0000875, published January 1, 2004. Because (1) the Vahedi et al. reference is not a statutory bar against the present application, (2) was published after the August 23, 2003 filing date of the present application, and (3) of the common ownership of the invention of the present application and the invention of the Vahedi et al. application, the provisions of 35 U.S.C. 103(c) indicate the rejection based on 35 U.S.C. 103(a) is not applicable. Consequently, the rejection of claims 64, 65, 68 and 69-79 as being obvious as a result of Vahedi et al., U.S. Patent Publication No. 2004/0000875 is overcome.

During the interview, Attorney for Applicants pointed out claims 15-23, 25-33, 35-37, 39-41, 66 and 67 were improperly rejected as being anticipated by Vahedi et al., U.S. Patent Publication No. 2004/0000875. Independent claim 15 requires three or more frequencies to be applied to the plasma to simultaneously cause plasma ion energy, plasma ion density and plasma chemistry of the plasma incident on the workpiece to be affected. Claim 16 more specifically indicates the plural frequencies are simultaneously applied to the plasma and the three or more frequencies also affect plasma ion energy, plasma ion density and plasma chemistry. Claim 25 includes a

similar limitation by requiring three or more frequencies to be selectively coupled to the first and second electrodes for enabling plasma exciting electric fields at the three or more frequencies to be coupled to the plasma. Claim 26 differs from Vahedi et al. by requiring a plurality of the frequencies to be coupled to a first electrode and coupling at least one frequency to a second electrode. Claim 41 distinguishes from Vahedi et al. by requiring a second electrode to be at a reference potential and for simultaneously causing a source arrangement to apply three or more frequencies to a first electrode. Claim 68 distinguishes over Vahedi et al. by requiring first and second frequencies to be applied to a first electrode while a third frequency is applied to a second electrode. Claim 67 distinguishes over Vahedi et al. by requiring a plasma source excitation arrangement for simultaneously applying first, second and third frequencies to a first electrode while a second electrode is at a reference potential.

In Vahedi et al., two power sources, 72 and 74, are at 2 MHz and 27 MHz, respectively. Sources 72 and 74 supply power to electrode 18, while electrode 26 is grounded; paragraph 0035. The 2 and 27 MHz sources 72 and 74 are variable power sources, such that changes in the power at 2 MHz result in variations in ion energy of plasma 22 that is incident on workpiece 20, while changes in the amount of power at 27 MHz result in variations of the density of plasma 22; paragraph 0043. There is no disclosure in Vahedi et al. of supplying three frequencies to the plasma that affect in the density of ions in the plasma, as well as the plasma chemistry. Further, bottom electrode 18 is not responsive to three frequencies and top electrode 26 is not responsive to any frequency since it is connected to ground. Based on the foregoing,

the Examiners agreed at the interview that Vahedi et al. does not anticipate claims 15-23, 25-33, 35-37, 39-41, 66 or 67.

At the interview, Attorney for Applicants pointed out that claim 15 was improperly rejected as being anticipated Donohoe et al., U.S. Patent No. 6,309,978. Claim 15 requires three frequencies to be applied to the plasma so that the three frequencies simultaneously affect plasma energy, plasma density and plasma chemistry. While Donohoe et al. discloses applying three frequencies to the plasma, these three frequencies are very close to each other, as indicated by Figures 7 and 8. The three frequencies of Figure 7 are spaced from each other by a total of 100 kHz, that is, 2.5% of the 4.00 MHz center frequency of the three frequencies. In Figure 8, there are five frequencies, at 3.90, 3.95, 4.00, 4.05 and 4.10 MHz. The separation between the 3.90 and 4.10 MHz frequencies is 200 kHz, that is, 5% of the mid-range frequency of 400 MHz. There is nothing in Donohoe et al. indicating the small difference between the frequencies affects plasma energy, plasma density and plasma chemistry.

The Examiner has the burden of proving the three frequencies disclosed by Donohoe et al. simultaneously affect plasma energy, density and chemistry. There has been no attempt in the Final Rejection to satisfy the burden the Examiner has of proving the three or five frequencies of Donohoe et al. affect plasma energy, plasma density and plasma chemistry. Donohoe et al. combines several frequencies to obtain a wave having a center frequency, such as 4.00 MHz, and side bands to obviate the need to turn power on and off. The Abstract emphasizes the three frequencies facilitate modulation of the driving or bias frequencies, which typically lie in a relatively narrow

frequency band. Figures 10-13 indicate the resultant waveforms obtained by the modulation technique Donohoe et al. discloses. These waveforms indicate how the low frequency beating signal 121 that is modulated on a 4.00 MHz fundamental frequency causes amplitude modulation of the fundamental frequency of the excitation wave that is applied to the plasma to enable the plasma to be effectively pulsed; see column 7, lines 50-52. While column 8, lines 33-45 of Donohoe et al. indicates the low frequency beating signal increases ion energy incident on wafer 18 and a combination of low and high frequency power components affects gas chemistry in the plasma, there is no indication that the frequencies Donohoe et al. applies to the plasma affect plasma density. During the interview, the Examiners indicated a review of the Donohoe et al. reference was in order.

During the interview, Attorney for Applicants opined that the present final rejection should be withdrawn and a new rejection should be issued based on Howard (U.S. Patent Publication No. 2005-0022933.) During the interview, Attorney for Applicants noted that Howard applies three frequencies to a plasma, such that two frequencies are applied to the bottom electrode and a third frequency is applied by the top electrode. The three frequencies that Howard applies to the plasma are in the same range as the three frequencies Applicants apply to the plasma. Consequently, Howard applies to the plasma three frequencies that affect plasma chemistry, plasma density and plasma energy. Attorney for Applicants noted that after the Howard reference is applied, Applicants will provide evidence to prove their invention was conceived and successfully reduced to practice prior to the Howard filing date.

In view of the foregoing comments, withdrawal of the final rejection and issuance of a new rejection based on Howard is in order.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

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